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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/019,350	10/19/2001	Michael Franks Robinson	0892161.000000US	1373

7590 09/28/2004

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EXAMINER	
ANDERSON, MATTHEW A	

ART UNIT	PAPER NUMBER
1765	

DATE MAILED: 09/28/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/019,350	ROBINSON, MICHAEL FRANKS	
	Examiner	Art Unit	
	Matthew A. Anderson	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 August 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *19 October 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 8/23/2004 has been entered.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-4,6, 8-26, 28, 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishizumi et al. (EPO 0683249 A1 and further in view of Oki (JP-58-125698) and McInerney et al. (US 6,143, 082).

Ishizumi et al. discloses a method and apparatus for vapor growth. The method is described in the abstract as capable of growing a compound

semiconductor layer having an evenness and an interfacial sharpness in units of atomic layers with a good productivity. Thus Ishizumi suggests a method that is commonly known in the art as an atomic layer epitaxy (ALE) or deposition (ALD). (see col. 1 and 2 Description of Prior art.) An example of the apparatus is shown in Fig. 1. Starting in col. 7, Fig. 1 is described. The chamber (1) has a cylindrical portion (1b) extending in a vertical direction. Portion (1b) has and upper (1a) and lower (1c) portion. (1a) is the end from which reactants are introduced through pipes (2) and (3). One pipe supplies the cation and the other the anion of the compound semiconductor to be formed. A substrate holder (5) lies in the cylindrical portion (1b) and holds the substrate (4). The example shown in Figs. 2A, 2b, and 2C shows the use of the partition plate (6) as the substrate is rotated from the, in this case, TMG side to the Arsine side. The gases are supplied sequentially to grow the GaAs (a III-V semiconductor) film of the substrate as the raw material gases are decomposed. Figs. 5A-5D show a modification in which hydrogen is used to form the partition of gases (i.e. a gas shield) within the chamber. Other compound semiconductors can be grown such as zinc selenide (see Fig. 7), gallium nitride (see Fig. 8), and gallium indium phosphide (Fig. 9). A useable substrate material is given in col. 12 line 15-20 as the known semiconductor GaAs. The examiner notes that many semiconductors are known in addition to SiC, such as GaAs. Heat is described as supplied to the substrate by the built-in heater in the substrate holder (5). Temperatures are specific to the material to be deposited and examples in col. 13 include 500'C and 800-1000'C for GaN.

Ishizumi et al. does not explicitly disclose separate temperatures for the raw materials added or that different heating mechanisms be used.

Oki et al. discloses a method and an apparatus in which separate gas streams are used to supply raw material compounds to a reactor used in deposition of a compound III-V semiconductor. (see abstract) A line supplying one raw material (6) has a separate heating element (7) within it. Fig. 3 shows an electrically activated (i.e. a wire) heater. The other raw material is supplied to the reactor separately. A heating RF coil (3) heats the substrate (4) within the chamber.

McInerney et al. discloses a multi-station processing chamber similar to that of Ishizumi et al. and suggests optimization of the process parameters such as temperature in col. 11 lines 5-15.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to combine the Oki , McInerney et al. and Ishizumi et al. disclosures because then the temperatures at which the raw materials were decomposed could be more easily controlled as suggested by Oki et al. (see page 3 of the translation, 1st full para.). and McInerney et al.

In respect to claims, 1-4, 6, 8-10, 15, it would have been obvious to one of ordinary skill in the art at the time of the present invention to perform a method of epitaxial growth of a material on a substrate including decomposition of multiple gas precursors in a separate and sequential manner at different temperature using different heating mechanisms because separate heating and gas supply

are suggested by the presented references. Oki et al. suggests multiple heating devices in such a method.

In respect to claims 11-14, it would have been obvious to one of ordinary skill in the art at the time of the present invention to optimize the temperature of the substrate and the decomposition temperature of the precursor because temperature was known to effect the deposition process and two temperatures were suggested by Oki et al.

In respect to claims 16, 19-26, 28, 30 it would have been obvious to one of ordinary skill in the art at the time of the present invention to produce the apparatus thus described with a wire heater in one supply inlet, a heater to heat the substrate, a means for moving the substrate because Oki suggests such as for controlling the temperatures of the raw material gas streams of such deposition systems. The manner in which the apparatus is actually used is not germane to the question of patentability of that apparatus.

In respect to claim 17, it would have been obvious to one of ordinary skill in the art at the time of the present invention to form the second inlet adjacent to the substrate support because that is were the raw material is directed.

In respect to claim 18, it would have been obvious to one of ordinary skill in the art at the time of the present invention to design a gas inlet including a elongate slot or just a plain hole because the Oki et al. has slots as does Ishizumi et al. where gas is admitted to the chamber and the working of such slots is well within the limits of engineering skill.

4. Claims 5, 7, 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishizumi et al. as applied to the claims above.

Ishizumi et al. combined is described above.

Ishizumi et al. combined does not disclose the deposition of SiC or Group IV semiconductors.

In respect to claims 5, 7, 27, it would have been obvious to one of ordinary skill in the art at the time of the present invention to use the method of Ishizumi et al. to deposit the known compound semiconductor SiC or those composed of Group IV because Ishizumi et al. suggest such use for non-specific compound semiconductor deposition. (col. 2 lines 45-50) Motivation would be found in that a broad range of compound semiconductors deposited would expand process flexibility.

5. Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ishizumi et al. as applied to the claims above, and further in view of Neda et al. (US 5,656,773).

Neda et al. discloses a device with a heating wire. In column 5 lines 59-64, it was conventional to use Pt heating wires.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to use Pt (a known and common chemical catalyst) as a heating wire because it was successfully used in such a capacity in the past.

In respect to claim 29, it would have been obvious to one of ordinary skill in the art at the time of the present invention to form the heating wire from Pt (a

known catalyst) because such material was used by Neda as a wire heater and because of the commonly known property of Pt as a non-reactive noble metal.

Response to Arguments

6. Applicant's arguments filed 6/04/2004 have been fully considered but they are not persuasive.

The argument that the heating of the first and second precursors to their respective different decomposition temperatures was new and unobvious was not convincing. The above Office Action addresses the cited amendment to the claims and thus answers this line of argument. Oki et al. discloses two heating means in such a process and apparatus and McInerney et al. discloses temperature optimization in each step of a multi-station method and process.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew A. Anderson whose telephone number is (571) 272-1459. The examiner can normally be reached on M-Th, 7-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571) 272-1465. The

fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

MAA
September 23, 2004

NADINE G. NORTON
SUPERVISORY PATENT EXAMINER